



Design News

Flash forward

Terry Costlow -- 1/5/2006

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As cell phones add more functions and MP3 players hold more songs, the common denominator is flash memory, which offers soaring capacities and falling prices. Flash holds the promise of faster speeds and far greater capacities, which should open new markets while putting pressure on the makers of small hard disk drives.

Phoenix-based Semico Research recently boosted its 2006 forecast for NAND flash from \$11 billion to \$13 billion, a 25% increase over 2005 revenues. NOR flash growth will be nearly as good, up 19% this year, rising to \$13 billion by 2008.

Underscoring the huge demand for nonvolatile solid state memory, these revenues are rising despite sharp pricing declines. "The cost per Mbyte of flash is dropping at 40-50 % per year," says Michael Yang, product marketing manager at Samsung Semi of San Jose, CA.

Flash technology is currently on a hot growth spiral, as increased capacity drives demand upward. Digital cameras and MP3 players become more popular as they hold more, and new applications such as digital video recorders open up. More of these new markets are expected. "A map of North America in a GPS system requires two Gbytes of flash. That capacity also opens up applications like audio books, which are basically MP3 players for books," Yang says.

Rising capacity

Currently, a NAND chip can store up to 16 Gbits, so they are used in data storage applications like cameras and MP3 players. NOR technology, used in cell phones and other applications where code storage is more important than holding data, capacity currently tops out at 1Gbit.

Vendors are trying various techniques to increase overall density. SanDisk Corp. of Sunnyvale, CA recently acquired Matrix Semi, a maker one one-time programmable flash known for its chip stacking techniques. "They have innovative stacking, we hope to bring that to read-write flash and increase density," says Wes Brewer, vice president of product marketing at SanDisk. Intel and STMicroelectronics recently teamed up to use the same 90 nm processes and work together on shared 65 nm technology. "This gives cell phone designers two fully compatible sources," says Philippe Berge, Marketing Director for STMicro's Memory

Division in Geneva, Switzerland. It also gives flash far more of a future than technologists once predicted. "Intel and ST are talking about pinouts for 35 nm chips. That's two generations beyond what people said was the limit a few years ago," says Jim Handy, nonvolatile memory director at Semico.

Drive to compete

While flash makers compete with each other, those at the high end are also competing with compact hard disk drives. However, companies like Apple have shifted to flash when it reaches capacities of low-end hard drives. Apple's decision to use flash for the iPod nano is heralded as a major win for flash suppliers who compete with compact disk drives.

Hard drives have far higher capacities and a far lower price per Mbyte, but don't have the ruggedness of semiconductors. Designers of both flash and disk drives are looking at new technologies that hold the promise of much higher capacities.

Drivemakers are moving to perpendicular recording, which lets them pack far more bits in the same space. This long-awaited technology is now making it into commercial applications, creating a spike in capacity while trimming cost. "With perpendicular recording, disk pricing per Mbyte will fall off the cliff," Handy says.

However, flash vendors are working on their own disruptive technology, doubling the number of bits per cell. This technology, also long-predicted, may occur before the end of decade, putting four bits in cells that now hold two, doubling capacity without requiring more silicon.

Pushing speed and cost

Another benefit over hard drives is speed. Chips provide faster speeds, and they're increasing as chipmakers move to smaller line widths. "At 130 nm, we ran at 54 MHz. That increased to 108 and 133 MHz at 90 nm," says Ed Doller, flash CTO at Intel.

Vendors are also introducing new techniques that blend technologies to offer better overall performance. Spansion LLC, a Sunnyvale, CA, startup formed by AMD and Fujitsu, recently added ORNAND to its portfolio. "ORNAND offers faster read speeds than NAND and faster write speeds than NOR," says John Nation, Strategic Marketing Manager at Spansion.

While the industry's main focus is on higher capacity, there are also cost-sensitive applications that need more capacity than the embedded flash capacities of microprocessors. For low system costs, serial flash helps reduce board layer count with simplified interconnection. "The big advantage from a system standpoint is that the overall cost of ownership is lower because of the low pin count," Berge says.

Web Resources:

Intel: <http://www.intel.com/design/flash/>

SanDisk: <http://www.sandisk.com/>

Samsung: <http://www.samsung.com/Products/Semiconductor/NANDFlash/index.htm>

Semico: www.semico.com

Spansion: <http://www.spansion.com/>

STMicro: <http://www.st.com/stonline/products/families/memories/memory/index.htm>

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